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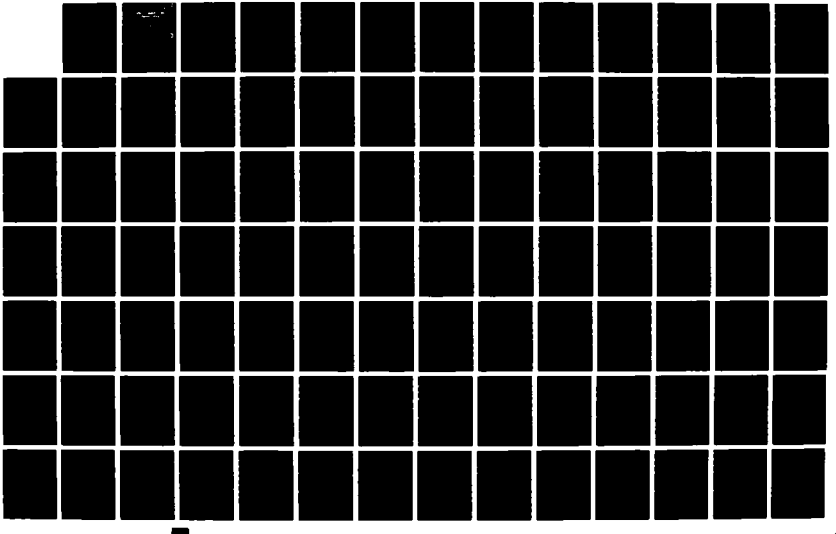

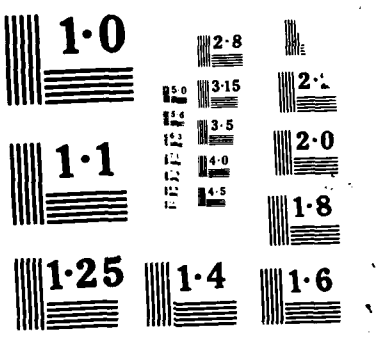
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THESIS

DEFENSE TRANSPORTATION ISSUES: MSC - BREAKBULK SHIPPING; MAC - CIVIL RESERVE AIR FLEET (CRAF) PROGRAM; AND MTMC - DEFENSE FREIGHT RAILWAY INTERCHANGE FLEET (DFRIF)

by

Betty J. Putnam

December 1987

Thesis Advisor: Dan C. Boger

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Defense Transportation Issues: MSC - Breakbulk Shipping;
MAC - Civil Reserve Air Fleet (CRAF) Program; and
MTMC - Defense Freight Railway Interchange Fleet (DFRIF)

by

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ABSTRACT

This thesis examines various Department of Defense (DOD) transportation issues relating to the Military Sealift Command (MSC), Military Airlift Command (MAC), and the Military Traffic Management Command (MTMC). Specifically, a history of the MSC, the demise of breakbulk shipping, and its impact on strategic sealift requirements are discussed; a history of the MAC, its reliance on the civil airline industry for augmentation of organic airlift resources (Civil Reserve Air Fleet (CRAF) program), and the status of the CRAF are reviewed; and a history of the MTMC, its rationale for owning rail assets, and the feasibility of a CRAF-type program for rail are examined. Additionally, a brief overview of the newly organized United States Transportation Command (USTRANSCOM) and its impact on the Transportation Operating Agencies (TOAs) (MSC, MAC, and MTMC) is provided.

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I. INTRODUCTION

A. BACKGROUND

The current capability of the United States Department of Defense (DOD) to deploy and sustain military forces worldwide is dependent upon a mixture of airlift, land transportation, and sealift forces--the defense transportation system.

Transportation is a key factor of any nation's military ability. Because of the critical role of transportation in our national defense, it is important to study the evolution of the defense transportation system and analyze the cause and effect relationships of major problem areas within the present system. [Ref. 1:p. 18]

The primary mission of the defense transportation system is to provide logistical support for strategic mobility in support of national security objectives. This demands a logistical capacity to deploy and sustain military forces whenever and wherever needed, as rapidly and as long as operational requirements dictate. [Ref. 2:p. 16]

To sustain our forward military strategy and our forward strategic mobility capability, the defense transportation system consists of organizations that enhance the nation's surge capability and sustainability during conflict. These organizations are called transportation operating agencies (TOAs). As sole managers of a particular transportation

resource, the TOAs collect and analyze requirements within their areas of transportation responsibility and allocate available capabilities. [Ref. 2:p. 16]

The defense transportation system is comprised of the Military Sealift Command (MSC), the Military Airlift Command (MAC), and the Military Traffic Management Command (MTMC). The relationship between the three TOAs is simple. MTMC will load, plan, and manifest equipment that will be sealifted by MSC. MSC will then "marry-up" equipment to the personnel flown in by MAC [Ref. 2:p. 16].

Generally, each TOA acts independently with respect to day-to-day operations. In the event of an emergency, however, the TOAs work in conjunction to ensure adequate lift is allocated. Previously, coordination of TOA assets was assigned to the Joint Deployment Agency (JDA) who allocated transportation assets and provided information as required to support theater Commanders in Chief. [Ref. 2:p. 16]

In April 1986, President Reagan announced plans to replace the JDA with the United States Transportation Command (USTRANSCOM) as a result of recommendations from the Blue Ribbon Commission on Defense Management (The Packard Commission). The commission, and other previous studies, concluded that a unified transportation command would better serve the national security interest of the United States and its allies by centralizing responsibility for the most

effective use of the military's transportation system in wartime [Ref. 3:p. 1].

B. STATEMENT OF THE PROBLEM

The primary mission of the TOAs is to maintain the required state of readiness necessary to support the deployment/employment of combat forces. Within each TOA, major problems exist which could adversely affect its mission.

The MSC's strong breakbulk shipping capability has diminished due to a continuing disappearance of breakbulk shipping from the U.S. merchant marine inventory. Conventional wisdom of military logistics planners has dictated that the breakbulk freighter is more efficiently designed for military purposes. Chapter II provides an analysis of the need for breakbulk ships to meet strategic sealift requirements.

The MAC relies heavily on the civilian airline industry to augment organic airlift resources in the event of a national emergency through a program called the Civil Reserve Air Fleet (CRAF). The CRAF is projected to increase MAC's airlift capability by 50%; however, current problems within MAC and the airline industry render this projection questionable. Chapter III will address these problems and outline the current status of the CRAF program.

The MTMC manages the transportation of personnel, equipment, and supplies throughout the continental United States to MSC's ships, MAC's aircraft, or to commercial overseas carriers. To provide these services to all of DOD, MTMC functions as a transportation manager, operator, advisor, and engineer. Chapter IV will discuss MTMC's role as a transportation operator. Specifically addressed will be MTMC's operation of the Defense Freight Railway Interchange Fleet (DFRIF) and whether or not DOD should own rail assets.

Chapter IV presents conclusions and recommendations to include a discussion of the newly developed USTRANSCOM.

II. MILITARY SEALIFT COMMAND (MSC)

A. INTRODUCTION

The Military Sealift Command (MSC) is the DOD's strategic sealift transportation force. Its primary mission is "to provide sealift for strategic mobility in support of national security objectives" [Ref. 4:p. 2]. In that role, it must deploy and sustain military forces on a global basis, for as long as needed. This is accomplished through two principal sources: U.S. Government-owned ships and the U.S. merchant marine. The Government-owned ships are operated by MSC and used primarily for military exercises or kept in a reserve status in the National Defense Reserve Fleet (NDRF) (Note 1) or the Ready Reserve Force (RRF) (Note 2). These ships provide only a small portion of the sealift capability required. The U.S.-flag merchant marine fleet transports the bulk of DOD cargo requirements in times of war or national emergency. These ships are either chartered or requisitioned by MSC from the U.S. merchant marine. [Ref. 4:p. 2]

Note 1: After World War II, excess merchant ships were sold to citizens and noncitizens to reduce the size of the inactive fleet. Those ships not sold were placed in the NDRF and maintained by the Maritime Administration. These ships augment the active U.S. fleet during times of national emergency and can be activated in 30-45 days. [Ref. 5:p. 39]

Note 2: The RRF is a component of the NDRF and is comprised of self-sustaining ships with a high degree of military utility. They can be activated in 5, 10, or 20 days. Sources

for these ships are (1) upgraded NDRF ships, (2) MSC retired ships, and (3) commercial sector procurement. [Ref. 3:p. 2-1]

Clinton H. Whitehurst, Jr., outlined several problems facing the MSC in his book, The Defense Transportation System: Competitor or Complement to the Private Sector? Mr. Whitehurst asserted that the continuing disappearance of breakbulk shipping from the U.S. merchant marine inventory would adversely affect DOD sealift capability.

This chapter will debate this assertion by:

1. Providing a brief history of the Merchant Marine and the MSC
2. Providing an overview of breakbulk shipping
3. Discussing the capabilities of breakbulk ships as well as its successors' capabilities (RO/RO, barge-carrying, and containerships)
4. Comparing the ships
5. Providing conclusions

B. MERCHANT MARINE/MSC HISTORY

The United States, in every war or conflict, has depended heavily on the U.S. merchant marine to meet strategic sealift requirements. [Ref. 7:p. 5]

Between 1800 and 1840, U.S. ships carried 90% of America's foreign trade. The percentage declined during the next two decades, but the U.S. clipper fleet still transported 66-73% of the foreign trade. However, the advent of the steamship in 1838 and the United States' unchanging

dependence upon its clipper fleet eventually dropped its foreign commerce share to 10%. [Ref. 7:p. 5]

With a virtually non-existent merchant fleet at the beginning of World War I, the U.S. government embarked on a massive shipbuilding program. Between 1916 and 1919, more than 3,200 ships were built; however, most of the ships were delivered after the war ended. [Ref. 7:p. 5]

Prior to World War II, the United States was again faced with inadequate sealift resources. The ships built during World War I had been allowed to deteriorate. In response, Congress enacted the Merchant Marine Act of 1936, which was designed to promote a viable merchant fleet. Five hundred new ships were to be built over a 10 year period; however, World War II began just after this effort was initiated. [Ref. 7:p. 6]

> When the United States entered World War II, its most noteworthy maritime contribution was not in vessel design, but in the ability to mass-produce ships. The best-known merchant ship of World War II was the Liberty ship built three months before Pearl Harbor. All told, 2,742 were built. The Liberty was followed by the Victory ship, of which 531 were constructed. Some 6,400 merchant-type ships, including 1,200 small craft, were built between 1937 and 1945. At the war's end, the government-controlled merchant fleet stood at over 5,000 vessels. [Ref 8:p. 27]

Throughout World War II, the Army and Navy maintained separate ocean transport capabilities. In fact, four organizations managed shipping operations in support of the war effort: the Army Transportation Service, the Naval Transportation Service, the War Shipping Administration, and

the Fleet Service Forces. Subsequent to the war, the Joint Chiefs of Staff recommended that the Navy manage all sealift transportation. In 1949, the Military Sea Transportation Services (MSTS) was established. At the same time, the Maritime Administration and the Federal Maritime Board were formed to administer civilian maritime programs and subsidy programs, respectively. In 1956, the Secretary of the Navy (SECNAV) was designated as the DOD Single Manager for sealift. [Ref. 7:pp. 6, 7]

Inadequate maritime support was an issue also in the Korean Conflict for the following reasons:

1. The Maritime Administration was in its infancy, and was operating under temporary leadership, lacking even the basic authority to requisition ships or enter into agreements by which requisite vessels could be chartered.

2. The aging U.S. fleet was nearing obsolescence (primarily because of vessel speed), and no comprehensive shipbuilding program was in sight to replace outmoded vessels.

3. The agency that had been responsible for the majority of the logistical planning conducted prior to 1950, the Security Resources Board, had oriented most of its wartime planning toward long-range, all-out war, such as had been experienced in World War II. Planning for more limited, localized conflicts was virtually nonexistent [Ref. 7:pp. 7,8].

The MSTS was the only agency capable of meeting the initial strategic sealift requirements of the Korean Conflict, eventually transporting 30,000 tons of military supplies per day. This was accomplished through the acquisition of over 400 chartered and government-owned

acquisition of over 400 chartered and government-owned reserve ships, support from private operators, and a nucleus fleet of 174 ships. The end of the Korean Conflict resulted in yet another peacetime reduction of the merchant fleet. [Ref. 7:pp. 8, 9]

In 1965, the MSTS-controlled fleet and the merchant marine ships totalled 135 and 965, respectively. During the Vietnam War, the ships activated from the NDRF and other charters/general agency agreements totaled 501. This enabled the MSTS to satisfy wartime sealift requirements. In 1970, the MSTS was redesignated the Military Sealift Command. After the war, the MSTS-controlled fleet and the merchant marine were again reduced to meet peacetime requirements (See Table 1 for current inventory). [Ref. 7:pp. 8, 9, 10]

C. MSC ASSETS

Headquartered in Washington, D.C., MSC is comprised of approximately 8,000 civil service employees, military personnel, and contract mariners. Manpower allocations are as follows:

1. 3,700 MSC ship crew members (civil service)
2. 2,015 non-government mariners (U.S.-flag ships)
3. 1,500 civil service employees and 350 Naval Officers/enlisted personnel (shore-based staff)
4. 500 Navy military personnel (MSC Fleet Auxiliary and Special Mission Support Ships) [Ref. 9:p. 25]

As of September 1986, the MSC-controlled ships totaled 129. Table 1 gives a description on the fleet's status.

TABLE 1

MSC-CONTROLLED SHIPS

MSC Nucleus		
Cargo	1	
Petroleum *	8	
Special Mission Support	22	(2)
Naval Fleet Auxiliary Force	34	(4)
Prepositioned & Fast Sealift Forces	9	(8)
TOTAL NUCLEUS	74	(14)
Chartered **		
Cargo	13	
Petroleum	14	
Special Mission Support	2	
Naval Fleet Auxiliary Force	2	
Afloat Prepositioning Forces	24	
TOTAL CHARTERED	55	
GENERAL AGENCY AGREEMENT	0	
TOTAL MSC CONTROLLED	129	(14)

Note: Figures in parentheses, included in totals, represent nucleus ships not in active operation, i.e., activating, inactivating, phasedown, ready reserve, converting, and modification.

* Includes Bareboat Charters
** Does not include spot voyage charter ships

Source: Military Sealift Command 1986 Annual Report

Strategic Sealift programs have been initiated to enhance strategic sealift capabilities. These efforts include:

1. The conversion of eight containerships into Fast Sealift Ships with roll-on/roll-off (Ro-Ro) ramps for wheeled vehicles (able to carry the equipment for an Army heavy mechanized division).

2. The prepositioning of ships (13) near areas of potential conflict (can support three Marine brigades totalling approximately 50,000 men).

3. The Ready Reserve Force (RRF) will have an inventory of 120 ships by 1992.

4. Twelve crane ships are projected to be delivered and operational by FY 90.

5. Twenty-nine ocean surveillance ships delivered by mid 1990s.

6. Five fleet oilers to be delivered by FY 89. [Ref. 9:p. 25]

D. OVERVIEW OF BREAKBULK SHIPPING

Breakbulk shipping in the form of small coastal carriers has been around since the beginning of seaborne commercial activity many thousand years ago. Over the years, productivity and cost measured in cost per ton-mile have been inversely related as ships have increased in size and trade routes increased in length. However, as economies of scale at sea grew, they were degraded by diseconomies in ports. Costly port time and bottlenecks for the larger general cargo ships with proportionately bigger cargoes increased. Ports weren't taking advantage of new technology as fast as the shipping companies were: stevedoring, transshipments, and storage remained essentially unchanged. This lack of

progress and the associated costs pushed shipping companies into even more elaborate technology to reduce reliance on port operations whose management was unresponsive. [Ref.10:pp. 92-99]

Shipping is an extremely dynamic business that has few entry and exit barriers. Although ships are expensive, the industry isn't considered particularly capital intensive because the ocean "highway" is free to the user. The terminal infrastructure can be provided by others, permitting shipping companies flexible ship utilization (to meet evolving market conditions and strategies). Conversely, port management has the perspective of managing a long term (probably national) asset which serves many social, political and economic purposes in addition to the purpose of loading and off-loading ships. [Ref. 10:pp. 92-99]

The Merchant Marine Act of 1970 encouraged and restated the need for a strong merchant marine and a viable shipping industry. It recognized that world trade had shifted from liner service to cargoes of bulk commodities prevalently transported in tramps or privately-owned ships. Other ship operational considerations included shifts to bigger ships, shorter port turnaround times, and decreasing manpower requirements associated with the newer, technologically advanced ships. For shipbuilding, the Act reflected more efficient, and even competitive, world markets. [Ref. 10:p. 103]

The Act's direction to shipping companies to become more competitive on the world markets encouraged companies to invest in new ships which would be unsuitable for most heavy military purposes. For instance, although breakbulk shipping was thriving in world trade as evidenced by the makeup of the ships delivered worldwide in 1978, not a single breakbulk ship has been built in the U.S. since the Act was passed. While not completely responsible, the Act indicated the future path the U.S. government was planning to take regarding breakbulk shipping and the merchant marine. Although breakbulk shipping was encouraged by the Act, the U.S. continued to lose market share in this basically non-liner trade. [Ref. 10:pp. 112, 113]

Common carriers operating routinely on established routes are referred to as liner companies. There were 19 of these companies twenty years ago; there were only seven in 1985. This decline has become predictable over the past several decades and has shown every indication of continuance despite support programs and measures enacted in the form of construction differential subsidies, operating differential subsidies, capital construction funds, Title XI guarantees, and reservation of 50% of government cargo. [Ref. 11:p. 64]

Three decades of neglect have resulted in today's sealift shortage. Several generations of service chiefs and senior civilians in the Pentagon, White House, Office of

Management and Budget, and Congress (who make the final budget decisions) can claim credit for the current state of breakbulk shipping. [Ref. 12:p. 21]

Even more serious than the lack of in-house sealift assets, is that the Pentagon can no longer rely completely on U.S.-flag merchant marine assets (as was done for the last three major conflicts) for sealift requirements. Since the late 1970s, there has been insufficient gross U.S.-flag sealift capacity (U.S.-flag ships available for projected national sealift needs). Moreover, many of the ships that are available are too highly specialized for general military sealift requirements. [Ref. 12:p. 21]

E. DISCUSSION/PROBLEMS

From the standpoint of national security, one of the most important distinctions to be made among cargo ships is that of military utility. Generally, ships supporting military operations are more useful if they are:

1. Relatively small - able to go in and out of shallow harbors and narrow channels;
2. Flexible - able to carry a variety of cargoes;
3. Self-sustaining - able to load and off-load cargo without specialized shore facilities [Ref. 13:p. 32].

Ships that have restricted military usefulness include: dry bulk or ore ships, LNG/LPG tankers, special product tankers, refrigerator ships, ferries, harbor tugs, coated

tankers over 80,000 DWT, uncoated tankers, and Great Lakes operators. [Ref. 14:p. 24]

Current literature indicates that militarily desirable characteristics are at-odds with characteristics of the most efficient ships. Commercial ships tend to be large, specialized, and dependent on port facilities for efficient loading and off-loading of cargo. [Ref. 13:p. 32] Current economics of trade demand ships that are ill-suited to military requirements. [Ref. 15:p. 20]. Conventional wisdom of military logistics planners reflects that the breakbulk freighter with its old-fashioned cargo rigging is more efficiently designed for military purposes even though large crews are required to operate and load/unload them. This is true primarily because of their minimal pier support requirements. [Ref. 13:p. 32]

Generally there are three basic types of militarily useful ships besides the breakbulk: the self-sustaining (SS) and non-self-sustaining (NSS) containership, the roll-on/roll-off (RO/RO) ship, and the barge ship (lighter-aboard-ship (LASH) and the sea barge (SEABEE) type).

Eighty-five percent of general cargo can be placed in containers. The remaining cargo has required the design and manufacture of heavy capacity loading and unloading machinery and systems. Larger deck and superstructure openings and increased cargo areas allowed these ships to accommodate a

wider range of cargo types. In addition, special combination-type vessels were designed which could accommodate bulk cargoes, containers and conventional breakbulk cargo, i.e., SL-7 (Fast Sealift Support Ships). [Ref. 16:p. 122]

In the following section, characteristics, advantages, disadvantages, and comparisons of the breakbulk, the RO/RO, barge-carrying (LASH/SEABEE), and containerships will be discussed.

F. BREAKBULK

The most recent breakbulk type ship is the Challenger class C-4. Causeway sections, LCM-8s (landing craft, mechanized, Mark VIII), and other outsized cargo can be carried on the weather deck of such craft. Most of the ships are old, however, and have a limited lifting capability. They are self-sustaining in port operations, but require large teams of personnel for rigging operations, and turnaround time is extended as a result. Freighter discharge rates are low compared to modern ships, and many transshipment points must be operated to handle large cargo capacities quickly. Terminal requirements for breakbulk shipping are large; consequently, reliance on mobilization of Reserve Component units to provide terminal support is necessary. Although any ship is valuable in wartime, the low Logistics Over-the-Shore (LOTS) delivery rate, relatively

long load-out times required, and high system costs make breakbulk freighters the least satisfactory ship type for modern military supports. [Ref. 17:pp. I-18-29]

The major advantages of the breakbulk ships are:

1. Their ability to be loaded and unloaded in the underdeveloped and damaged port facilities through the use of their on board booms [Ref. 18:p. 17].

2. They are suitable for LO/LO without major changes.

3. They are suitable for outsize cargo without change, subject to limitation of lift capacity.

4. They are suitable for lighters for LCM-8 and smaller craft at stow locations where lift capacity permits [Ref. 17:p. I-26].

The major disadvantages are:

1. Their conventional cargo-handling systems have relatively slow loading/discharge rates. Additionally, only approximately one-half of the breakbulk ships have cranes with the capacity of 60 tons, the minimum required for handling heavy military equipment [Ref. 18:p. 20].

2. They are not suitable for RO/RO without major change. They would require ramps and doors in the shell and bulkheads. This would be costly, would seriously affect ship survivability, and is considered not feasible.

3. They are limited in container capability due to difficulty of moving within holds and lack of fit of cube to space.

4. They are incapable of transporting Non-Self-Deployable-Aircraft (NSDA) due to lack of headroom [Ref. 17:p. I-26].

G. BARGE SHIPS

The barge-carrying ship is nearly as versatile as the breakbulk freighter and provides the capability to transport many kinds of equipment which are hard to handle on conventional freighters. Turnaround time for a barge carrier to load/unload is very short, thereby increasing its potential for movement of cargo. With respect to military significance, the barge-carrier system is able to provide its own lighterage. Off-loading barges at the shoreline is an easier operation than unloading ships in port. [Ref. 17:p. I-21]

There are two types of barge ships in the U.S. merchant fleet: the LASH type and the SEABEE type. These two types are sufficiently different to warrant separate description.

LASH ships have been built on both C-8 and C-9 hulls and can carry barges or containers or both. Containers, when carried, are loaded and discharged by an on-board container crane. The barges are loaded/unloaded by means of a 500-ton capacity gantry crane, which is mounted aboard an adapter (designated the LCM-8 Lifting Beam). This allows the gantry crane to lift other items such as landing craft and causeway sections onto and off of the ship. [Ref. 18:p. 20]

Folding platforms can be used for carriage of non-barge cargo on LASH ships. When the ship carries barges, these platforms are collapsed and stowed along the bulkheads of the barge loading area. When the ship carries breakbulk cargo, the platform would be broken out and erected by the ship's

crane. The primary objection to this method is that the barge crane is incompatible with breakbulk cargo and would necessitate modification depending upon the cargo. [Ref. 17:p. I-23] The additional advantages of the LASH ship are:

1. Vehicles in LO/LO mode can be handled in barges.

2. For outsize cargo, it is suitable up to the capacity of the barges. Larger equipment can be carried on deck, if compatible with the crane.

3. Containers can be carried in barges although stowage is lost on some barge designs. At the cost of barge-carrying capability, ships of this type have the capacity to carry some containers in cells, and cell guides can be installed in additional spaces. Containers can be loaded and discharged at the rate of 15 an hour (subject to transship effectiveness of shore establishments) [Ref. 17:p. I-29].

The disadvantages are:

1. NSDA is suitable only with substantial loss in cargo stowage capability. Helicopters can be placed in barges or carried below deck, stowed on the tops of barges, with top barges omitted.

2. Only LCMs are suitable as lighters, and these must be stowed on deck. [Ref. 17:p. I-29].

The SEABEE ship is similar in size to the LASH ship except that it carries barges substantially larger than the LASH barge. Barge loading is accomplished by means of a submerging 2,000-ton capacity elevator located in the stern of the ship. The barge is positioned over the submerged elevator which then lifts the barge from the water up to the desired loading level. The barge is then transported longitudinally on a rail system from the elevator platform to the desired location for stowage. [Ref. 18:pp. 20-23]

Military vehicles and all helicopters except the CH-54 can be carried below deck with minimum disassembly when the barges are absent. Helicopters can be flown off the top deck, and can aid in fixed wing aircraft off loading. The SEABEE can carry Army aircraft without sectionalization and can carry all items of equipment organic to Army units. The critical shortcoming of this ship type is that only three have been built for commercial service. [Ref. 17:p. I-22] The advantages of the SEABEE are:

1. RO/RO is suitable via elevator.
2. LO/LO is suitable in barges.
3. Outsize cargo of a wider variety is possible with a greater ease of handling.
4. Containers are suitable using materials handling equipment or by stowing on chassis in RO/RO configuration. Containers can be stowed on barges.
5. NSDA handling on two decks under cover and one weather deck is possible.
6. Lighters are suitable up to the capacity of elevator and transporter. Cradles are required for shaped hulls.
7. Helicopters can be carried on this ship class better than on any other merchant ship [Ref. 17:p. I-28].

No major disadvantages of the SEABEE are evident.

The major advantages of both types of barge ships are:

1. They possess a rapid and self-contained loading/unloading capability.
2. They have a capacity for heavy and/or outsize loads.
3. They require no lighterage.

4. Their barges may be grouped and used as a floating covered storage area [Ref. 18:p. 23].

An important characteristic of the barge-carrier system is that the ships are large enough to carry equipment and systems with which to establish port terminal facilities. This constitutes a major improvement in force deployment capabilities. [Ref. 17:p. I-23]

The major disadvantages of both types of bargeships are:

1. LOTS problems still remain if a port is not available. A deep draft (8-10 ft) precludes the barges from being beached and from being unloaded by cranes located at the beach.

2. Powered craft are required to move the barges between the ship and the cargo unloading/loading site.

3. Transshipment problems remain [Ref. 18:p. 23].

H. CONTAINERSHIPS

A conventional containership is a ship specifically designed to carry containers stacked in cells within the ship. Since the cargo has an outer shield for protection, the additional time required to secure the cargo is eliminated. To load the ship, containers need only be lifted aboard and placed into the appropriate cell. Even the hold covers can serve as additional storage space upon which containers can be stacked and secured. [Ref. 14:p. 14]

Containerships are classified into two general categories: self-sustaining (SS) and non-self-sustaining (NSS). The self-sustaining ship loads unloads its containers

with a gantry crane (or other integral lifting equipment), independent of shore support. A number of the older, smaller SS vessels will continue to serve certain trade routes and be used for special purposes. [Ref. 18:p. 23] Unfortunately, an inadequate number of SS ships are available to sustain a reliable military sealift system. They are used primarily for resupply operations, in small scale operations, and in the opening phases of gradual force build-ups. [Ref. 17:p. I-20]

New containerships depend upon terminal container cranes for loading and discharge. Containership discharge systems are required when there is a lack of commercial terminals or when military exercises are conducted via LOTS. The two significant options are to construct container cranes at military terminals and to install cranes on NSS ships. Also, the use of helicopters/blimps to load/unload containerships in the absence of cranes is a viable solution. [Ref. 17:p. I-20]

The capacity to carry general cargo is important. The SEALAND SL-7s, for example, have about 14,000 square feet of hold space reinforced to carry tanks and other heavy equipment. Also, container ships can be converted to provide open decks for breakbulk stowage of equipment. [Ref. 17:p. I-20] Sea sheds (Note 3) and flatracks (Note 4) achieve the same objective without ship modification.

Note 3: A sea shed is a cargo module that fits into a container ship's cell guides. Essentially, the module converts a container ship into a breakbulk ship. It can also be used on bulk carriers. [Ref. 19:p. 307]

Note 4: Flat racks are designed to fit in the vertical cell guides of containerships, and several may be placed side by side to form a "tray" for outsize cargo. [Ref. 14:p. 33]

Converting containerships to carry breakbulk cargo has potential military utility. However, this would adversely affect productivity of the containership while still engaged in commercial trade; consequently, it is acceptable only as a last resort. [Ref. 17:p. I-21]

The major advantages of containerships are:

1. Containers are ideally suited to move commercial supplies and freight over land, sea, and air routes from origin to destination; consequently, there is an improved capability to integrate all transportation modes.

2. It has a large cargo capacity. These ships have annual cargo lift capacities equivalent to three to five times those of breakbulk vessels.

3. It can be rapidly loaded and unloaded (70% less port time for containerships versus breakbulk ships).

4. Its containers may be used for storage of cargo ashore.

5. Shorter transit times result in more frequent sailings and more efficient asset utilization [Ref. 14:pp. 15, 16].

The major disadvantages include:

1. NSS containerships require external facilities for loading and unloading cargo.

2. The size and weight of the cargo transported is limited by the dimensional and structural constraints of the containers [Ref. 18:p. 24].

3. Large marshalling areas are required to segregate the containers prior to further movement. As a result, these ships normally are constrained to operate from one equipment-intensive port facility to another. This characteristic reduces the number of vessels available for support of military operations in under-developed areas or in support of LOTS operations without causeway/relocatable pier assets.

4. No hardware standardization within the container community (in spite of the International Standards Organization's efforts). Internal structural strength and maximum weight capacities differ among the various container users. Individual firms continue to design and use containers which best suit their own needs, resulting in a range of containers and accessory equipment.

5. Different intermodal ships can accept only a limited number of each size container or only a specified size container. Consequently, few of these high-tech ships can substitute for one another in the commercial sector, let alone serve the specialized military requirements without major adaptation and auxiliary ship-to-shore systems in most contingency situations [Ref. 14:pp. 16, 17].

I. RO/RO SHIPS

RO/ROs provide access for wheeled vehicles, via ramps, to the interior and the various decks of the vessel. RO/ROs are designed with a variety of configurations and deck heights and for specific trades and certain classes of cargo and rolling stock. One type incorporates the use of up to three shore-based side ramps and is designed primarily for the carriage of over-the-road semi-trailers. These ships have

annual cargo lift capacities equivalent to three to five times the lift capacities of breakbulk vessels. Any type of wheeled vehicle can be accommodated: oversized trailers and pieces of equipment, e.g., truck cranes and construction equipment, and mobile homes can also be easily accommodated on RO/RO ships. Every deck has sufficient headroom to permit stowage of full-height truck-trailer units. Another type of RO/RO is designed to handle a variety of cargo as well as wheeled vehicles. [Ref. 16:p. 126]

The advantages of the RO/RO are:

1. They carry their own cargo handling equipment, configured to negotiate the restricted maneuvering area and low headroom below decks.
2. Containers can be stowed on or under the deck.
3. Some ships have a revolving crane on the foredeck, which provides a limited LO/LO capability [Ref. 16:p. 129].
4. NSDA is satisfactory if rolled on board [Ref. 17:p. I-30].

The disadvantages of the RO/RO are:

1. They have limited outsize cargo capability, except for the Sea Bridge class.
2. They are not suitable for lighters, except for the Sea Bridge class [Ref. 17:p. I-30].
3. The small RO/RO inventory limits their capacity to deliver military vehicles for major deployments. (The SEABEE class ship can provide additional RO/RO capability. The LASH cannot, because its basic hull structure prevents installation of access doors for vehicle drive-through) [Ref. 17:pp. I-23, 24].

Several types and sizes of RO/RO vessels are equipped with loading ramps that lower directly from the stern. These vessels must therefore moor fantail to pier to load or unload cargo. This caused problems in ports where the ships could only approach from either side due to maneuvering or traffic restrictions. In these instances, portable floating platforms equipped with ballasting capability to permit raising or lowering with respect to tidal ranges and vessel ramp heights were developed. [Ref. 16:pp. 129, 131]

The RO/RO ships are critically important for sealift support operations. Since vehicles are a significant part of the military cargo requirement, particularly during build up and reinforcement periods, even a few RO/RO ships impact positively on the overall deployment shipping effort. The 23 RO/RO vessels in commission are favored also because of their speed. [Ref. 17:p. I-23]

F. CONCLUSIONS

The demise of breakbulk shipping is not a critical factor in overall strategic mobility.

As mentioned, the most useful ships for military operation planners tend to be relatively small, flexible (able to carry a variety of cargoes), and self-sustaining. Comparisons made between breakbulk and the RO/RO, barge, and containerships reveal the following:

1. Relatively Small. The length of the breakbulk ship is at least 100' less than the next smallest

vessel, the containership. This allows for greater maneuverability in small channels and, in some instances, allows for mooring without tugs if required. The beam of the breakbulk ship is from 15' to 31' narrower, again allowing for enhanced maneuverability (although not as much a determining factor as the length of the vessel). However, the draft of the smaller breakbulk ships is only 2' less than RO/RO vessels and is as much as 4' deeper than the least of the other ships (LASH). This suggests that the other ships would be better suited to shallow water channels, typical of those encountered in underdeveloped countries. [Ref. 18:pp. 19, 21, 22, 25, 26]

2. Flexibility

a. Although breakbulk ships are suitable for LO/LO, lighters, and small craft, they are not suitable for RO/RO and outsized cargo subject to limit of lift capacity.

b. They are limited in container capacity and NSDA capability.

c. RO/ROs, on the other hand, can handle a wide variety of cargo to include general cargo, containers, and outsized/heavy cargoes (Sea Bridge class) and have LO/LO capability.

d. Containerships have a large cargo capacity, but they are not suitable for RO/RO. Stowage of outsized cargo can be achieved by on-deck tie down, flatracks, and sea sheds.

e. Barge-carrying ships approach the versatility of the conventional breakbulk ship and can carry a multitude of equipment which is hard to handle on conventional freighters. Besides the barges and the variety of cargo that can be carried in the barges, these ships offer container capability, heavy lift, and outsized cargo unrivaled by other types of U.S. merchant vessels. [Ref. 20:p. 11]

(1) The LASH does not have RO/RO capability, but LO/LO, outsized equipment, and containers can

be handled in barges. It also has NSDA and lighter capability.

(2) The SEABEE class is LO/LO, RO/RO, container, NSDA, lighter, and outsize cargo (up to capability of elevator/transporter) suitable.

3. Self-sustaining. One of the selling points of breakbulk ships is that they are self-sustaining; but this characteristic is also applicable to the other ship types.

a. The RO/RO carries its own cargo handling equipment and portable floating platform to the pier and has a revolving crane.

b. Currently, only a small portion of the containerships are SS; however, 12 crane ships are to be operational by 1990, and eight large containerships are being converted into Fast Sealift Ships with RO/RO ramps to alleviate the problem.

c. Barge-carrying LASH ships have on board container and 500-ton gantry cranes. The SEABEE vessels have a 2000-ton capable elevator and can discharge its cargo in open waters near contingency areas without the aid of sophisticated port facilities. For example, in the Joint LOTS program, all forms of Table of Organization and Equipment (TOE) handling gear, which were truly outsized cargo, were loaded on both the LASH and SEABEE. Cranes, loaders, landing craft and causeways were all handled. The SEABEE even loaded an 800-ton DeLong Pier without a container crane mounted on it. [Ref. 20:p. 11]

Based on the above, the vessels most suitable for the majority of military logistical support scenarios are RO/RO, barge-carrying vessels, containerships, and breakbulk, in approximately that order. Breakbulk shipping is still required but its importance has waned as new OPPLANS have

been developed to incorporate changed transportation asset realities.

What impact has the demise of breakbulk shipping had on the MSC? Since the MSC has a significant role in maintaining a contingency sealift capability, the diminishing breakbulk capability has forced the MSC to look elsewhere for sealift assets. While working within the constraints of a declining merchant marine and industrial base, MSC has employed a combination of acquisitions, conversions, and new ships. Additionally, new developments such as sea sheds and flatracks have helped to overcome the breakbulk deficiency.

III. MILITARY AIRLIFT COMMAND (MAC)

A. INTRODUCTION

Of the three Department of Defense (DOD) Transportation Operating Agencies (TOAs), the Military Airlift Command (MAC) is the key to immediate response. MAC is the manager of all DOD point-to-point international airlift with a tremendous resource base comprised of a fleet of military cargo and passenger aircraft, support personnel, specialized equipment, and constant inter-service and civilian airline industry coordination. This resource base is utilized to ensure MAC meets its worldwide mission requirements. [Ref. 21:p. 16]

U. S. military strategy depends heavily on airlift. Maintaining a peacetime presence in overseas countries such as West Germany and Korea with the ability to quickly reinforce them in an emergency is one aspect of the strategy. The other aspect is to have the capability of deploying forces quickly to other countries where no peacetime contingencies exist. [Ref. 22:p. 1-1]

The 1981 Congressionally Mandated Mobility Study established a strategic airlift requirement of 66 million ton miles a day (mtm/d) [Ref. 23:p. 39]. The MAC is capable of meeting about one-third of this requirement [Ref. 22:p. 1-1]. The Civil Reserve Air Fleet (CRAF) Program, a system by which the DOD augments organic airlift and provides monetary incentives for carriers to invest in aircraft suitable for

defense requirements, eliminates the deficit in passenger airlift capacity. With respect to cargo airlift, where the greatest shortfall exists, the CRAF is capable of providing only 35% of the cargo airlift required to overseas locations in the event of a national emergency. The shortfall exists because of a general decline in the air cargo industry, which is the focus of this chapter. Because the airlines, through their voluntary participation in the CRAF, are projected to carry 95% of the passenger and 35% of the cargo requirements, military/civil relations are critical to airlift requirement planning. [Ref. 21:p. 18]

This chapter will address the MAC/CRAF relationship, including a brief history of both, current problems, and conclusions. Also, the CRAF enhancement program, the pre-deregulation environment, the effects of deregulation on the CRAF, and the post-deregulation environment will be discussed. Although the MAC has a multiplicity of other roles to fill (weather information to all DOD agencies, aeromedical airlift missions, and special operations forces), these are beyond the scope of this chapter.

B. MAC HISTORY

The United States Army Air Forces and the Navy in all theaters of operations provided air transportation during World War I. Heavy airlift requirements and insufficient aircraft resulted in the Secretary of War (under Presidential

authorization) taking control of all transport aircraft within the civil aviation industry. [Ref. 1:p. 51]

World War I airlift requirements and efforts were minimal relative to today. This was due to both the capability of the aircraft and the knowledge of how to use airlift assets. During the years between World War I and the United States' entry into World War II, aircraft capabilities increased dramatically. During World War II, airlift played a significant role in transporting critical supplies and forces. A complete history of airlift efforts in World War II is outside the scope of this chapter; however, significant airlift was employed in all theaters of conflict.

In June 1948, as part of the general reorganization of the Department of Defense, the Secretary of Defense consolidated the responsibility for large and long-range airlift into the Military Air Transport Service (MATS). The U.S. Navy, however, still had control of some airlift capability. The charter of MATS resembled a commercial airline's: the transportation of passengers and cargo on scheduled flights. The first major milestone for the MATS was the 1948 Berlin Airlift. This operation highlighted the value of airlift to military and civil leaders and also showed that current aircraft designs were unsatisfactory for the transportation of large amounts of cargo. [Ref. 1:pp. 51, 52]

Another significant event in the growth of the MAC occurred in 1956 when the Secretary of the Air Force was designated as single manager for military airlift services. Subsequently, MATS was designated the single manager operating agency for military airlift services. Widely scattered crises during the 1950s highlighted the need for quick airlift response to support deployed forces. Jet airlift aircraft gave MATS this capability. In 1965, Congress recognized the importance of airlift and directed that a new command be established and placed on a par with other Air Force combat elements: On 1 July 1966, MATS officially became MAC. [Ref. 1:pp. 52, 54]

The evolution of MAC continued during the Vietnam conflict and post-conflict wind down. Eventually, Specified Command status was approved by the President in 1976 and became effective in 1977.

> As a specified command, the Commander-in-Chief, MAC, reports to the President through the Secretary of Defense (SECDEF) during periods of conflict; and to the Joint Chiefs of Staff during exercises; and as otherwise necessary to insure operational support to the other specified and unified commands." [Ref. 1:p. 54]

Specified command status improved management of airlift resources by simplifying and streamlining command relationships and having the Commander in Chief of MAC report directly to the National Command Authorities (as are other Commanders in Chief of specified and unified commands). [Ref. 1:p. 54]

As part of the execution of its functional responsibilities, MAC maintains aircraft in the various levels of readiness required for strategic and tactical airlift requirements and for airlift training exercises. MAC routinely supports worldwide logistical needs of the DOD aspart of training exercises. In addition, MAC participates in annual joint training exercises ranging from individual service efforts to joint allied efforts both to refine procedures and demonstrate airlift capability. [Ref. 1:pp.59, 60]

C. MAC ASSETS

From headquarters at Scott AFB, Illinois, the MAC directs more than 94,000 active duty military and civilians and more than 1000 aircraft at over 340 locations in 26 countries. The command serves as the single DOD manager for airlift requirements. In FY 1986, it moved 517,000 tons of air cargo and 2,370,600 passengers on a combination of military and commercial contract flights. [Ref. 24:p. 112]

As of November 1986, MAC had a total of 1,033 military aircraft (Table 2). Also, MAC is augmented by aircraft assigned to the Air Force Reserve Units (Table 3).

TABLE 2

MILITARY AIRLIFT COMMAND AIRCRAFT

T/UH-1F	24	C-22	1
UH-1N	57	C-23	18
HH-1	22	C-130	251
C/HH-3	44	AC-130	10
HH-53	33	HC-130	30
UH-60A	10	MC-130	14
C-5A	69	WC-130	13
C-9	23	C-135	7
C-39	0	WC-135	7
C-12	40	C-137	6
C-20	3	C-140	8
C-21	80	C-141	263

TOTAL.....1,033

1. As of November 1986
2. Numbers are total active aircraft inventory
3. Reserve Associate Units fly C-5, C-9, and C-141 aircraft

Source: Defense Transportation Journal 1987 Almanac, February 1987, p. 21

TABLE 3

AIR RESERVE FORCES AIRCRAFT
(MAC-Gained)

Air National Guard		Air Force Reserve	
C-5	3		5
C-130	181		143
AC-130	0		10
EC-130	8		0
HC-130	8		14
WC-130	0		7
UH-1N	0		5
HH-3E	11		8
CH-3E	0		0

TOTAL.....408

1. As of November 1986

Source: Defense Transportation Journal 1987 Almanac, February 1987, p. 21

Additional airlift is available through the Civil Reserve Air Fleet (CRAF) program, a discussion of which follows.

D. CIVIL RESERVE AIR FLEET (CRAF)

The military/civil aviation relationship began in World War II when civil aircraft delivered "more than four billion passenger miles and one billion cargo ton miles for the military overseas" under contract with the Air Transport Command (ATC) and the Naval Air Transport Service [Ref. 25:p. 12].

President Truman created the CRAF in 1952 as a result of the World War II and Berlin Blockade experiences when civil aircraft supported military airlift. Approximately 50% of all ATC traffic was handled by each. The current relationship between the Air Force and the airlines is based on the initial foundation built by the ATC and the airline industry. [Ref. 26:p. 93]

Under the CRAF program, selected U.S. civil aircraft are contracted to augment DOD organic airlift in states of emergency. Active duty organic airlift capability can be doubled through CRAF augmentation which includes civilian crews, fuel, spare parts and maintenance. [Ref. 1:p. 60]

The CRAF program is composed of four segments: Domestic, Alaskan, Short-Range International, and Long-Range International. Aircraft are assigned to a segment depending on the nature of the requirement and the performance characteristics of the aircraft. [Ref. 1:p. 60]

1. Domestic/Alaskan Segments

The Domestic segment consists of short- and medium-range cargo aircraft. Alaskan segment aircraft operate within the Alaskan Air Command's area of responsibility. Most of this fleet provides Continental United States (CONUS) airlift for the Air Force's LOGAIR and the Navy's QUICKTRANS systems during peacetime. [Ref. 1:p. 61]

2. Short- and Long-Range International Segments

The Short-Range International segment consists of medium-range convertible cargo aircraft and supplements theater airlift forces. The Long-Range International segment is comprised of long-range passenger and cargo aircraft involved in trans-atlantic and trans-pacific requirements. This fleet augments the MAC's long-range intertheater C-141s and C-5s during periods of conflict. These civil aircraft are contractually bound by the airlines in the event of airlift emergencies. [Ref. 1:p. 61]

E. CRAF STAGES

The CRAF program is initiated in three stages in order to maximize aircraft utilization and tailor available assets to existing situations. The three activation stages are as follows.

1. Stage I

The Commander, MAC, authorizes Stage I activation which is designed to allow continued civilian industry operations while assisting the DOD. This stage occurs when MAC aircraft are diverted from routine missions in response to a contingency. Stage I aircraft must be made available within 24 hours. These aircraft are not the same as civilian aircraft involved in the MAC daily operations. These can also be assigned to Stages I, II, or III. [Ref.25:p. 13]

2. Stage II

The Secretary of Defense (SECDEF), in concert with the Secretary of Transportation, activates Stage II in response to minor contingency operations. Stage II provides supplemental airlift within 24 hours during emergencies that don't require national mobilization. [Ref. 25:p. 13]

3. Stage III

The President or Congress activates Stage III after a national emergency has been declared. The authority may be delegated to the SECDEF in concert with the Secretary of Transportation. Stage III activation may require all long-range/heavy-lift cargo and passenger aircraft within 48 hours. The Secretary of Transportation prioritizes and allocates all modes of transportation and must be involved in all CRAF activations. [Ref. 25:pp. 13, 14]

F. CRAF PARTICIPANTS

No legislative basis exists with respect to the CRAF program, in that the civilian airline industry is required to participate in the CRAF. The MAC/CRAF relationship depends primarily upon airline industry cooperation since participation is voluntary. Consequently, the DOD is very interested in the financial well-being of the airlines, especially those providing cargo carriers to the CRAF. Table 4 shows the carriers providing CRAF aircraft. [Ref. 27:p. 34]

TABLE 4

CARRIERS PARTICIPATING IN THE CRAF
Participants as of Dec 1986

Domestic Segment
- Evergreen International
- Spirit of America
- Interstate
- Southern Air
- Zantop

Alaskan Segment
- Markair
- Northern Air Cargo

Short-Range International Segment
- American Trans Air
- Key

Long-Range International Segment
- American
- American Trans Air
- Continental
- Delta
- Evergreen*
- Federal Express**
- Flying Tiger***
- Hawaiian
- Interstate*
- Northwest*
- Pan Am*
- People Express
- Rich International
- Rosenbalm*
- Skystar
- Skyworld
- Southern Air
- Transport
- Total Air
- Tower***
- TWA
- United*
- UPS***
- World**
- Zantop*

TABLE 4 (Continued)

* Airlines providing cargo aircraft
** Joint Venture (refer to Section L)
*** Joint Venture

Source: Defense Transportation Journal, June 1987, p. 34

G. CRAF ASSETS

The number of CRAF aircraft varies each month according to how many aircraft can be made available by the airlines. Table 5 indicates the aircraft allocated as of December 1986.

TABLE 5

CIVIL RESERVE AIR FLEET (CRAF)
Aircraft allocated as of Dec 1986

Domestic Segment (35)	Total
DC-9-30F	2
L-100 Series	17
L-188C	12
B-727C/PC	4
Alaskan Segment (11)	
L-100-30	3
DC-6	8
Short-range International Segment (13)	
B727	13
Long-range International Segment (307)	

Passenger (233)	Cargo (74)	Total
B707	7	3	10
DC-8	11	19	30
B747	112	36	148
DC-10	52	16	68
L-1011	45	0	45
B-767	3	0	3
A-310	3	0	3

Source: Defense Transportation Journal, June 1987, p. 33

CRAF airlift capabilities include the Boeing 747 (99 tons of cargo or 419 passengers), the McDonnell Douglas DC-10 (70 tons of cargo or 359 passengers), the Lockheed L-1011 (274 passengers), the Boeing 707 (30 tons or 149 passengers),and the McDonnell Douglas DC-8 (41 tons or 264 passengers). [Ref. 28:p. 6]

As of November 1986, there were 307 long-range aircraft assigned to the CRAF. Of that total, only 74 were cargo carriers. Five years ago, there were 126 freighters in the CRAF. The decline is due to a weakening air cargo industry. Noise abatement regulations forced the grounding of many 707s and DC-8s (those still operating were re-engined). Also, wide-body passenger aircraft with substantial cargo-carrying capacity in the belly space have posed significant competition. [Ref. 23:p. 40]

H. CRAF ENHANCEMENT PROGRAM

To maximize available assets and future aircraft resources, the MAC implemented the CRAF enhancement program. The program is designed to increase oversized cargo lift capabilities of large aircraft such as the B747, DC-10, and L-1011. As currently configured, existing cargo carriers cannot accommodate outsized or oversized cargo. [Ref. 25:p.14] Oversize cargo has dimensions exceeding 104 inches in length and 84 inches in width and cannot be palletized.

Outsized cargo has dimensions exceeding 828 inches in length, 117 inches in width, or 105 inches in height. Oversized cargo can be transported in the C-141, C-130, and commercial wide-bodied aircraft, excluding the Boeing 707 and the DC-8. [Ref. 29:p. 44] Depending upon contract specifications, the U. S. government reimburses the carrier for the higher costs in operating these heavier aircraft as well as for lost revenue while the aircraft is being modified. The modifications include the installation of a cargo door in the fuselage and a strengthened floor, in addition to cargo handling equipment. [Ref. 25:p. 14, 15]

To date, the contracts outlined in Table 6 are in effect with respect to the aircraft enhancement program:

TABLE 6

CRAF ENHANCEMENT PROGRAM CONTRACTS

Airline	Contract length	Cost per plane	Contract type	Delivery source	Delivery date	No. a/c
United	16 yrs	$15.8M	restrict*	prod. line	1982	1 DC-1010
PANAM	12 yrs	$30M	restrict	existing a/c	JUN 85- APR 89	19 B747s
FEDEXP	16 yrs	$4.3M	non-restrict*	prod. line	SEP 87	1 DC-1030

* Per public law, restrictive contracts do not allow use of main cargo deck for commercial services. Government pays for modification, weight penalties (cost of operating heavier aircraft), and out of service cost (down time for modifications).

TABLE 6 (Continued)

** Unrestrictive contracts allow use of main deck for cargo features for commercial use. Government is limited to not more than one-half of modification costs. The airline is responsible for the remaining cost plus any out of service and weight penalties.

Source: MAJ Randy Durham, CRAF Action Officer, Headquarters MAC/XPW, Scott AFB, IL, AV-576-6751

I. MAC/AIRLINE INDUSTRY CONTRACTUAL PROCEDURES

The MAC annually defines its mission requirements and contracts with U.S. commercial carriers for CRAF aircraft and air crews. The MAC submits requirements to the Department of Transportation (DOT) through the DOD. The Office of Emergency Transportation assigns CRAF aircraft to the stages by carrier and aircraft registration. [Ref. 25:p. 13] Mission requirements and civil contracts are funded through the Airlift Services Industrial Fund (ASIF). Hence, the military services reimburse MAC for transportation services on the basis of tariffs which are periodically revised to adjust for a breakeven position on revenues and expenses. [Ref. 30]

In exchange for making their planes available, the carriers are awarded a percentage of MAC's peacetime passenger and cargo business. How much business is awarded depends on the mobilization value of the carrier's specific aircraft. Currently, wide-body cargo planes or cargo-convertible planes are needed most by the Air Force, so

the mobilization value (which is based upon cargo carrying capacity) of those planes is high. For example, a carrier with a passenger-only 747 might have a value of one, while a carrier with a cargo 747 might have a value of four. If there is $500,000 worth of contracts available, the first carrier will receive a $100,000 contract, and the second carrier will receive a $400,000 contract. [Ref. 23:p. 39] Carriers are guaranteed airlift contracts based on their mobilization values; however, they must earn at least 60% of their total revenue from other sources or lose DOD allocations. This discourages "pure DOD carriers" and encourages U. S. air fleet growth [Ref. 31:p. 24]

However, a major problem exists: less than 50% of the DOD users have been able to identify their long-range cargo requirements in time for the annual solicitation of fixed entitlements. Consequently, the airline industry is seeking other industry contracts. MAC has short-term cargo requirements, but the airline industry isn't interested in tying up their assets for part-time work. Per the CRAF Action Officer at MAC Headquarters, "We're working on it." [Ref. 32]

Clearly, CRAF participation is predicted upon what is occurring in the airline industry. Therefore, before discussing the current problems with the CRAF program, a brief overview of the pre-deregulation environment as well as

deregulation and its general impact on the airline industry and the CRAF in particular is required.

J. PRE-DEREGULATION ENVIRONMENT

The Federal Government regulated the airline industry until 1978. During this period, the Civil Aeronautics Board (CAB) approved air routes and insured transportation in the majority of the United States. The CAB protected the financial health of carriers and encouraged airlines to participate in the CRAF program. [Ref. 25:p. 15]

When an airline requested an additional long distance route, the CAB would approve the request with the stipulation that the airline also operate flights in smaller, less lucrative areas. In addition, the CAB monitored the Essential Air Service (EAS) program whereas the government subsidized air service to small communities where traffic volume precluded carrier profit. The EAS is scheduled to terminate in 1988. [Ref. 25:p. 16]

Fares charged by carriers were regulated, also. Long distance flights were extremely profitable; thus, long range aircraft were abundant and a lesser number of smaller aircraft existed. The long range aircraft are most essential to the CRAF. [Ref. 25:p. 16]

During this time, the concern of the airline industry was the amount of DOD peacetime cargo allocated to the CRAF. In May 1971, Senator Warren Magnuson (D, WA) introduced Senate

Bill 1821, requesting a 50% share of DOD peacetime cargo for CRAF civil carriers. The House Committee on Commerce passed the bill but reduced the 50% allocation to 40%. No congressional action resulted, and subsequent bills were introduced in the House and Senate (H.R. 5085 and S. 1350). A mandatory amount of DOD cargo for air carriers was again established. This time the House bill set a 50% allocation; the Senate required 40%. However, final Congressional action was not taken to enact either bill into law. Starting in 1973 (primarily in response to the American withdrawal from Vietnam), total DOD cargo airlift requirements decreased. Commercial air carriers attempted to gain a larger share of the available cargo, but to no avail. [Ref. 33:pp. 81-83]

K. DEREGULATION

The Airline Deregulation Act of 1978 abolished the CAB, and granted airlines free entry/exit into the marketplace. From 1978 to 1984, the number of certificated airlines in the U.S. grew from 44 to 114. With a few exceptions, the new airlines, using non-union employees and cheaper, used aircraft, provided service between cities located only hundreds of miles apart. They established themselves in a limited market and gradually expanded their route structureas business and profit allowed. A "hub" system evolved whereby passengers were flown to a central base of operations and

then flown to the ultimate destination. This system optimized the use of smaller, more fuel efficient aircraft (DC-9s/737s) to transport passengers to a certain location and larger aircraft from the hub to the final destination. People Express perfected the concept (though it did not prevent it from financial insolvency), and most of the airline industry use this method today. [Ref. 25:pp. 16, 17] DOD's attitude toward deregulation was passive, relying primarily on the free market system to sustain sufficient strategic airlift capability. The failure of an airline was of no concern: another would take its place. DOD's attitude was that the CRAF aircraft would remain under one airline or another. The end result, however, was that total long-range capability declined from 16.238 mtm/d (May 1982) to 9.86 mtm/d (December 1986). A significant portion of the decline was a result of noise abatement regulations. [Ref. 27:p. 34]

L. POST-DEREGULATION ENVIRONMENT

Since deregulation, specific problem areas have surfaced with respect to the financial stability of the airline industry and the ASIF, unrealistic strategic airlift requirements, and the failure to convince major airlines to add defense features to their planes. A discussion of each area follows:

1. Financial Stability of the Airline Industry

a. Mergers/Consolidations/Discontinued Operations.

(1) In 1986, Texas Air merged with Eastern, People Express, and Frontier. As a result, Texas Air became the largest airline, controlling almost 20% of the scheduled passenger market. [Ref. 27:p. 33]

(2) When United purchased Pan Am's Pacific Division, it became the second largest with a 16% market share. [Ref. 27:p. 33]

(3) American Airlines controls 13% of the market, making it the third largest airline. Its internal growth started initially by adding new flights, hubs, and lower paid workers, then moved to purchase AirCal. Delta's take-over of Western gave it an 11% market share, and the TWA/Ozark merger gave TWA a 9% market share. [Ref. 27:p. 33]

(4) Pan Am is ranked 6th with a 7% market share, and US Air is ranked 7th with a 3% market share. [Ref.27:p. 33]

(5) Pan Am and American Airlines ceased cargo operations in 1983 [Ref. 23:p. 40]. Pan Am is viewed as a prime takeover candidate, as a result of significant losses. World Airlines ceased scheduled service in September 1986. [Ref. 27:pp. 33, 34] Trans America, the third largest CRAF carrier, ceased operations in 1986, reducing CRAF mtm/d capacity by .8. [Ref. 23:p. 40]

(6) Flying Tiger, the largest CRAF contract and the world's largest and oldest international air cargo firm, announced in November 1986 it would liquidate unless certain concessions were made by its employees. These have been made, and Flying Tiger's financial status seems to be improving. [Ref. 23:p. 40]

b. Overnight Package Deliver Business Expansion.

Although this business expanded rapidly, it hasn't filled the void left by the decline of the air cargo business. First,

the package carriers' aircraft aren't constructed to carry heavy cargo. Although UPS has purchased narrow-bodied 757s, the floors aren't sturdy enough to carry military cargo pallets. Second, these carriers are concerned about the competitive disadvantages should their planes be activated. Their fleets are relatively small and competition is fierce. The activation of 10 planes, for example, could adversely affect their operations. [Ref. 23:pp. 40, 41]

The third reason involves the regulations for entrance into CRAF. For example, four crews must be assigned to each plane, and CRAF participants have to be certified air carriers. These carriers don't have the manpower to dedicate four crews to each plane. Also, air carriers using leased planes aren't considered certified. Most aircraft in the package carrier business are leased. [Ref. 23:p. 41]

Both Emery and UPS are competing with Federal Express and DHL International in the European market. However, it appears a shake-out is forthcoming. As number one, Federal Express controls over 50% of the market share. UPS follows with approximately 16%. Burlington, Emery, Purolator, Airborne, and DHL each have a smaller shares of the market but tough price-cutting and competition are increasing the chances of consolidations among this segment of the airline industry as well. [Ref. 27:p. 33]

c. International Arena.

The airline industry has suffered in the international market as well. Terrorist attacks in Europe and the Middle East, coupled with the nuclear accident in the Soviet Union, have adversely affected summertime travel. Pan Am and TWA, with primary markets in Europe, suffered losses of $276 million and $257 million, respectively, in the first six months of 1986. [Ref. 27:p.33]

2. Financial Stability of the Airlift Service Industrial Fund (ASIF)

MAC mission requirements and civil contracts are funded through the ASIF. This revolving fund was established with an initial working capital of $75 million (known as the "corpus") in FY 1959 and has grown to where the financial operations approximate $2 billion. [Ref. 30]

Basically, the ASIF is structured the same as any commercial enterprise. The initial capitalization finances operating expenses resulting from the airlift services provided to its users (Army, Navy, and Air Force). The users are billed for the services and reimburse the ASIF. [Ref. 30]

The key to success in any industrial fund environment is to have the tariff rates close to the cost to buy the service. Tariff rates are established approximately nine months prior to a fiscal year and are computed by dividing estimated expenses by estimated ton miles. Due to an "arbitrary" reduction by the Office of the Secretary of

Defense of $125 million per year and losses due to increased transportation costs in the civil sector (only recovering 85% of each dollar spent), the ASIF is projected to be insolvent by February 1988. The current balance of the corpus is $40 million. The "arbitrary" program budget decisions were reclamaed in December 1986 to Deputy Defense Secretary William H. Taft IV and denied. [Ref. 30] An interesting sideline: In the fall of the 1986, Secretary Taft told the National Defense Transportation Association conference, "After 34 successful years, the CRAF program is facing severe problems. We are losing CRAF capabilities, and we have not been able to replace them" [Ref. 23:p. 40]. Maybe the approval of addition funding would help to replace the assets! The Assistant Secretary of Defense Comptroller was briefed on the ASIF status in October 1987. Speculation at this point is that funds within DOD will be reprogrammed to keep the fund afloat. After that, the future of the ASIF is unknown. [Ref. 30]

3. Unrealistic Strategic Lift Requirements

As previously stated, a 66 mtm/d strategic airlift requirement was established by the 1981 Congressionally Mandated Mobility Study. To attain this, the Air Force's Master Plan established a 14 mtm/d requirement for the CRAF by the mid-1990s. CRAF is projected to meet that goal even with the current situation. The 66 mtm/d requirement, however, is viewed as unrealistic. Per the Air Assistant in the Pentagon's transportation office, the baseline on the

smallest scenario is 85 mtm/d. Given this, it appears that the CRAF would have to provide a minimum of 20 mtm/d. If the current trends continue, however, CRAF's capacity will fall to about 10 mtm/d by the year 2000. [Ref. 23:pp. 39, 40]

4. Defense Features

Airlines, with the exception of those listed in Table 5, have shown little interest in purchasing wide-body aircraft equipped with defense features. The primary reasons for this lack of interest are:

(1) The airlines are concerned that aircraft activation will reduce their competitive edge (their competitors will still be flying). MAC is reviewing the CRAF activation system to determine an equitable method. The major airline consolidations that are occurring may present away to do this since, at some point, there may be only six to seven major airlines. Therefore, the problem of activating ten aircraft, for example, from a small airline and economically crippling it will be eliminated. This, however, doesn't solve the problem of CRAF aircraft activated from the international market, where foreign airlines could feasibly have routes to themselves. [Ref. 23:p. 42]

(2) Service to key international routes will be limited due to the increased weight imposed by the defense features (10,000 - 20,000 lbs). It would be impossible to fly non-stop, international routes with the added weight; consequently, the carriers would not be competitive in the international market. The route limitations concern is still under study. Major growth is occurring in the non-stop Asian market: aircraft with defense features cannot compete on a non-stop route. [Ref. 23:p. 42]

(3) No compensation exists to offset the risk of competitive harm, range limitations due to additional weight, and the probable low resale value of the aircraft. These concerns are difficult, if not impossible, to quantify unlike the funding for the installation of defense features and subsequent operating costs. [Ref. 23:p. 42]

defense features and subsequent operating costs. [Ref. 23:p. 42]

M. MAC'S SOLUTIONS

To address some of the problems with respect to CRAF, the MAC relaxed the CRAF entrance requirements and established the joint venture program in 1986 (FY 87) which opened the CRAF to operators and/or carriers previously excluded. In the event of an activation, joint venture firms' aircraft and crews are combined as a single entity with an existing CRAF participant. This has enabled MAC to utilize the significant cargo fleet of an overnight parcel company such as UPS. However, Flying Tiger's financial problems may end one of MAC's joint ventures. Furthermore, Flying Tiger's airlift capability to the CRAF is lost unless another CRAF carrier buys Flying Tiger's aircraft. Since most airlines are exiting from the cargo business, and overnight package operators may undergo a major shakeout in the future, the sustained inventory of freight aircraft seems doubtful. [Ref. 27:p. 34]

Additionally, MAC is projected to propose changes with respect to the CRAF program. If the changes are made, they will help CRAF meet its 14 mtm/d requirements. To reverse the decline in the CRAF, major airlines must be recruited. If all the aircraft scheduled for production were built with defense features, CRAF capability would be 30 mtm/d. [Ref. 23:p. 41]

Some officials, including MAC's assistant for civil air, think more money is the answer. This, however, may be viewed as subsidizing the airlines. Says the current Air Assistant in the Pentagon's transportation office, "The policy of this administration is straight forward: We're not in the business to subsidize; we're in the business to incentivize" [Ref. 23:p. 42]. The airlines' concerns are DOD's concerns because the existing shortfall in cargo airlift capacity could be alleviated with the projected purchase of 274 wide-body aircraft from 1987-1994. These aircraft could add approximately 16 mtm/d to CRAF by 1995; however, modifications are necessary to meet DOD/MAC airlift requirements. [Ref. 23:pp. 37, 38, 41]

It appears that legislation mandating defense features is forthcoming. A heated debate is sure to follow. MAC sees it as the airline's duty for the good of the country; the airlines see it as government control. Shades of regulation, again? [Ref. 23:p. 55]

N. CONCLUSIONS

In summary, the primary problems with the CRAF program are:

1. A shrinking air cargo industry.
2. The lack of compensation to the airlines to offset the risks of competitive harm, range limitations due to additional weight, and probable low resale value of the aircraft for installing defense features. As already stated,

this is difficult, if not, impossible to quantify.

3. MAC's inability to project long-range cargo requirements. Less than 50% of the users have been able to identify their requirements in time for the annual solicitation for fixed entitlements. MAC is working to resolve this problem.

4. Stringent CRAF entrance requirements into the program. MAC has relaxed some of the requirements and others are being reviewed.

5. ASIF funding shortfall. Future of the fund is pending resolution by the Assistant Secretary of Defense Comptroller.

The future of the CRAF needs to be comprehensively evaluated. The CRAF enhancement program and the joint ventures will add additional capability to the CRAF. However, they won't ensure sustained strategic airlift capabilities.

It is projected that 20% of the Western Hemisphere's jet aircraft fleet will be on short-term leases by 1991, due to tax law changes, consolidations, and market forces. This gives the airlines significant flexibility in changing types of aircraft to meet supply and demand and further destabilize the CRAF. Additionally, the major airline leasing company isin Ireland. Foreign flag aircraft are excluded from CRAF. [Ref. 27:p. 34]

Some options available to DOD/MAC are:

1. Purchase and store freighters for future activation. This parallels the Navy's Ready Reserve Force [Ref. 27:p. 35].

2. Mandate the installation of defense features to existing and production aircraft (government

funded). This is viewed by some as the only way to get airline industry participation [Ref. 23:p. 38].

3. Provide additional incentives in the form of increased cargo contracts to the civil sector. Currently, DOD provides $1 billion worth of business each year into a $50 billion per year industry. Currently, MAC is trying to determine the impact of increasing the $1 billion to $2-3 billion. Although the DOD only accounts for 2% of the airline industry business, it is the largest customer of the airline industry, giving it a lot of leverage to negotiate [Ref. 23:p.39].

IV. MILITARY TRAFFIC MANAGEMENT COMMAND (MTMC)

A. INTRODUCTION

The Military Transportation Management Command (MTMC) is the first leg of the strategic transportation triad. It is a

> jointly staffed, industrially funded, major Army Command through which the Secretary of the Army carries out single manager responsibilities for the management of military traffic, land transportation, and common user ocean terminals in the Continental United States (CONUS) and selected overseas areas. [Ref. 1:p. 101]

MTMC manages the transportation of personnel, equipment, and supplies throughout CONUS to MAC's aircraft, MSC's ships, or to commercial overseas carriers. To provide these services to all of DOD, MTMC functions as a transportation manager, operator, advisor, and engineer. [Ref. 34:p. 28]

This chapter will focus on MTMC'S role as a transportation manager. Specifically, the MTMC's operation of the Defense Freight Railway Interchange Fleet (DFRIF) will be addressed.

Clinton H. Whitehurst, Jr., in his book, The Defense Transportation: Competitor or Complement to the Private Sector?, questioned the need for DOD-owned rail assets. The question was posed again by Deputy Defense Secretary Taft during the Army's FY 88-92 Program Objective Memorandum (POM) submission. As a result of Secretary Taft's inquiries, the Army's POM submission for railcar procurement was cancelled and a DFRIF study was initiated to explore the feasibility of

utilizing private sector assets to meet strategic mobility requirements. [Ref. 35:p. ES-1]

This chapter will address the following questions regarding the DFRIF as well as provide a brief history of the MTMC:

1. What is the rationale behind DOD-owned rail assets?
2. Can industry meet DOD peacetime and mobilization requirements by purchasing DOD railcars and leasing them back?
3. What is the feasibility of instituting a CRAF-type program for rail?

B. MTMC HISTORY

The DOD transportation structure was reviewed in 1944. Although consolidation of the services was strongly recommended, the timing of the proposed change (during World War II) was deemed poor. Post-war reconsideration resulted in the National Security Act of 1947. [Ref. 1:p. 102]

The Act directed that the Secretary of Defense eliminate unnecessary duplication in the areas of procurement, supply, transportation, storage, health and research. Merging the services into one organization or radically changing service missions was not the intent of the Act. There were many advocates of a single service; however, the benefits of efficiency and economy could be optimized through common or cross-servicing arrangements between interdependent, unified services. Unification efforts relating to land

transportation and traffic management functions are reviewed next. [Ref. 1:p. 102]

Lessons learned from World War II indicated that military transportation activities needed to be structured to maximize efficiency and effectiveness. Duplication of effort was commonplace in the traffic management, port operations, and sea and air transport activities. Although the establishment of coordinating agencies and cooperation of the military services minimized this somewhat during the war, duplication continued throughout the DOD transportation arena. [Ref. 1:pp. 103, 104]

The first step to eliminate unnecessary duplication of effort was the assignment of transportation by service: air, land, and sea were assigned to the most qualified military service. Air transport went to the Air Force; sea transport to the Navy; and land transport to the Army. As a result, the Air Force and Navy Military Air Transport Service (MATS) was established in 1948, ultimately becoming the Military Airlift Command (MAC) in 1966. In 1949, the Army and Navy ocean shipping responsibilities were combined under the auspices of the Military Sea Transportation Service (MSTS) (later renamed the Military Sealift Command (MSC)) to provide ocean carrier service for the three military services. Unified airlift and sealift services were attained, and unnecessary duplications in military transportation were reduced. [Ref. 1:pp. 104, 105]

The unification of land transportation was a slower process. Other military services resisted traffic management consolidation under the Army because traffic management and the supply mission of each service were thought to be inseparable. To alleviate the problem somewhat, the Secretary of Defense established the Military Traffic Service (MTS) in 1950 to provide regulatory guidance for the underlying problem: the continued duplication of transportation services and traffic management operations. Constant review of the problem gained more support for the consolidation of land transportation functions. For example, overseas commanders were authorized to designate the Army responsible for all land and related transportation matters. [Ref. 1:pp. 105, 106]

By the end of the Korean Conflict, no unified traffic management service existed comparable to MATS and MSTS. However, by 1955, the single manager concept for land transportation and traffic management was developed. [Ref.1:p. 107]

> The Single Manager Plan was a concept whereby the Secretary of one military department was designated by SECDEF as a Single Manager responsible for the performance of all management functions related to a specified common user item or service for all departments. This concept was applied to the Secretary of the Army in 1956 for traffic management within CONUS [Ref. 1:p. 108]

As a result of a Secretary of Defense-directed interservice study of the CONUS air and ocean terminal

system, the Secretary of the Army was designated as the Single Manager for Military Traffic, Land Transportation, and Common-user Ocean Terminals, which he delegated to the Military Traffic Management and Terminal Service (MTMTS). MTMTS was redesignated as the Military Traffic Management Command (MTMC) in 1974. [Ref. 1:pp. 113, 114]

C. DEFENSE FREIGHT RAILWAY INTERCHANGE FLEET (DFRIF)

As the Single Manager for military traffic, land transportation and common-user ocean terminals, MTMC is responsible for the control and operation of all DOD owned railway interchange assets. " The Secretary of the Army and the MTMC, as the Executive Agent, plan, program and budget for the acquisition, modification, and maintenance of DFRIF equipment" [Ref. 35:p. 1].

DFRIF assets are comprised of railcars needed to support a full mobilization which aren't readily available from the civil rail industry such as heavy duty flatcars and rail cars not supplied by the railroads (tank cars and depressed center flatcars to support the Naval Nuclear Propulsion Program). DFRIF assets are outlined in Table 7. [Ref. 35:p. 1]

TABLE 7

DFRIF INVENTORY
as of May 1987

TANK CARS GP	10K (FUELS)	761
TANK CARS GP	20K (FUELS)	283
TANK CARS SP	20K (MULTICHEMICALS)	60
TANK CARS SP	10K (MULTICHEMICALS)	81
BOXCARS END DOOR	70-TON	30
REFRIGERATOR CARS (TRIDENT II MOTORS)	70-TON	2
FLATCARS	140-TON CHAIN TIE DOWNS	569
FLATCARS	100-TON (PAX TRUCKS)	98
FLATCARS	100-TON	570
FLATCARS	80-TON	147
FLATCARS	140/150-TON DEPRESSED CENTER	38
FLATCARS	150-TON	10
FLATCARS	300-TON	7
FLATCARS	200-TON	8
FLATCARS	200-TON WELL	3
FLATCARS	135-TON WELL	1
FLATCARS	90-TON WELL	4
FLATCARS	ESCORT	6
FLATCARS	ESCORT	5
TOTAL		2,683
FLATCARS IN-LEASED IN SUPPORT OF TITAN II		11
GRANDTOTAL		2,694

Source: DFRIF Study, MTMC, Directorate of Inland Traffic, Washington D.C., June 1987

MTMC-sponsored studies are conducted to determine peacetime and mobilization shipping requirements. These studies also analyze the strategic potential of commercial transportation assets, DFRIF car utilization goals, the projected economic life of new equipment, and the most cost-effective method to procure DFRIF equipment. [Ref. 35:p. 1]

The last study, conducted in 1984, indicated that 209 additional 20,000-gallon general purpose tank cars and 123 additional 140-ton flatcars were required. The study indicated that buying the additional assets was more cost-effective than any other method of procurement. [Ref. 35:p.2]

The DFRIF is comprised of primarily flatcars and tankcars (90%); consequently, the study only evaluated these types of cars. Also, all DFRIF 80- and 100-ton flatcars and most of the 10,000-gallon general purpose tank cars must be retired by 1994. The Association of American Railroad (AAR) Interchange Rules mandate retirement at 41 years of age. Therefore, only the DFRIF's newest 140-ton general purpose flatcars (569 total) and 20,000-gallon tank cars (283 total) will be addressed in this chapter. [Ref. 35:p. 2] DOD's short- and long-term railcar requirements will not be addressed, as this will be Part II of the DFRIF Study which is scheduled to be completed November 1987. [Ref. 35:p. 2]

D. HEAVY DUTY FLATCARS

DOD owns heavy duty flatcars to ensure contingency readiness. MTMC decisions to purchase heavy lift flatcars were based on the following:

1. DOD must be able to respond quickly in a contingency.
2. Loading of heavy tracked vehicles such as M1 tanks will begin at early deploying installations just prior to deployment and continue in a time-phased manner.

3. Little advanced warning prior to Mobilization Day will be provided to installations or industry.

4. Industry cannot effectively respond to a contingency with commercial assets until M+6 days, i.e., the seventh day of the mobilization. This response time is based on industry estimates and experience gained from military exercises [Ref. 35:p. 4].

DOD's purchase of the 569 140-ton chain tie-down flatcars were based on the following:

1. All 80- and 100-ton flatcars currently in the DFRIF must be mandatorily retired by 1994.

2. Under the Department of the Army's Force Modernization Plan, all M60 tanks will be replaced by larger, heavier M1 tanks.

3. Effective fielding of the M1 tank, subsequent tank modification and repair requirements, and military exercises will require significant peacetime railcar support.

4. Two M1 tanks can be loaded on a 140-ton flatcar with chain tie-down devices and secured without any blocking and bracing. Use of 140-ton flatcars will result in reduced costs and operational efficiencies.

5. The railroads have few flatcars capable of transporting two M1 tanks and, for economic reasons, are reducing the overall number of heavy duty flatcars in their fleets.

6. Prior to seeking funds for the initial purchase of 140- ton flatcars, MTMC met with the Association of American Railroad's Operating Transportation General Committee, composed of chief operating officers of the various major railroads. The purpose of this meeting was to inform the railroads of DOD's need for heavy duty flatcars capable of transporting two M1 tanks and to determine their interest in providing such cars Because of the limited commercial application of these cars and the somewhat sporadic requirements of DOD, it was determined that an investment by the railroads of this nature was not justified [Ref. 35:pp. 4, 5].

The depressed railcar building industry enabled DOD to procure the 569 140-ton flatcars at outstanding prices from three contractors. The first 101 cars were bought for $118,000 per car in FY 81. The next 144 cars were purchased in FY 82 for $97,153 per car, and the last purchase for 324 cars in FY 85 was for $85,298 per car. [Ref. 35:p. 5]

E. FINDINGS AND DISCUSSION

1. Finding 1

The 569 140-ton flatcars owned by DOD are required to meet DOD's peacetime and contingency railcar requirements [Ref. 35:p. 5].

Utilization of the 569 flat cars is as follows:

(1) One hundred and forty-nine are allocated for requisite peacetime needs. One hundred and fourteen are specifically allocated to the M1 tank program (production, fielding, modification, and repairs). From FY 87 to FY 90, over 2,800 M1A1 tanks will be produced and transported to continental United States (CONUS) installations and ports. Also, during that timeframe, approximately 1,100 tanks will be returned from overseas installations. The commercial industry does not have flatcars to support these efforts (two M1 tanks per flatcar-explained in Finding 2). The remaining 35 cars support miscellaneous peacetime requirements, travelling 135, 116 loaded miles during FY 86. [Ref. 35:p. 5]

(2) Four hundred and twenty of the flatcars support Strategic (STRAT) Pool requirements consisting of heavy lift needs of early deploying units within CONUS. The flatcars are prepositioned and projected to satisfy the strategic lift requirements of the first seven days of a contingency. Afterwards, commercial assets and returning DFRIF

equipment will be utilized. To satisfy DOD's early deployment requirements, MTMC established aminimum baseline of 420 cars. [Ref. 35:pp. 5, 6]

2. Finding 2

Transporting two M1 tanks on one flatcar with chain tie-downs results in transportation and transportation-related cost savings and operational efficiencies [Ref. 35:p. 6].

Transporting two tanks on a rail flatcar is more cost-effective than transporting one. Since chain tie-down equipment can be reused, standard blocking and bracing materials are unnecessary. In terms of operation effectiveness, deployment time and manpower requirements are lowered because fewer cars are handled. [Ref. 35:p. 6]

3. Finding 3

Industry has few heavy duty flatcars capable of transporting two M1 tanks. Further, industry's overall heavy duty railcar fleet has drastically declined over the past 10 years and is expected to decline further in the future [Ref. 35:p. 6].

In a 1987 Government Accounting Office (GAO) report entitled, "Deployment: Better Determination of Army Transportation Requirements is Needed," GAO indicated that only 107 industry-owned flatcars were available that could transport two M1 tanks. Additionally, GAO's report indicated that a 20% decline had occurred since 1983 in the inventory

of flatcars able to transport track vehicles. The commercially-owned flatcars capable of transporting DOD track vehicles were purchased initially for requirements within the farm machinery industry. This industry has deteriorated along with the flatcars. Over the past 10 years, containerization and the use of double stack cars has been the industry trend; consequently, a negligible number of flatcars have been built. According to AAR statistics, the industry has procured 204 new flatcars over the past 10 years while 14,405 have been retired. The American Railway Car Institute indicates this trend will continue. [Ref. 35:pp. 6,7]

4. Finding 4

Industry is not interested in purchasing DOD's 140-ton flatcars without a lease back provision. With this provision, industry is only minimally interested in purchasing DOD's 140-ton flatcars [Ref. 35:p. 7].

Based on a meeting between the MTMC, the AAR, and various commercial car management-car leasing company officials and subsequent DOD solicitations, no companies responded favorably with respect to procuring the 140-ton flatcars. The option of buying with a lease back provision was favorably received by only one company. [Ref. 35:p. 7]

F. ALTERNATIVES

1. Status Quo

Under this alternative, DOD would continue to own and control the 569 140-ton flatcars. The current market value of the flatcars is $47 million. FY 86 DFRIF administrative costs were $790,563 (civil service labor and benefits, materials and supplies, travel, office space, telephone and ADP support), of which $165,509 ($291 per car) was attributed to the 140-ton flatcars. Contingency readiness, significant transportation cost reductions, operational efficiencies, and mileage received from the railroads are the primary benefits of the status quo alternative. [Ref. 35:pp. 7, 8]

Minimal risks are involved with the status quo; DOD can meet strategic contingency and peacetime requirements in a timely, efficient manner. [Ref. 35:p. 9]

2. Sell and Lease Back

With this alternative, MTMC would contract with and sell the 140-ton flatcars to a leasing company and then lease them back. The private sector would own the cars, but MTMC would maintain operational and maintenance responsibilities and mileage revenues. One proposal was received with an opportunity cost of capital to DOD of more than $591 million. The status quo alternative is preferable economically. [Ref. 35:p. 9]

3. Sell Without a Lease Back Provision

This alternative has the railroad industry meeting DOD heavy lift flatcar requirements. No companies, however, were interested. Also, this alternative carries a high degree of risk since the industry doesn't have an adequate railcar inventory capable of transporting two M1 tanks and given the demise of commercially-owned flatcars in general. [Ref. 35:p. 10]

4. Scrap and Rely on Industry

This alternative represents the same risks as D.3. above and, therefore, is undesirable. [Ref. 35:p. 10]

5. Sell and Lease Back Under a Contingency Contract

Under this alternative, DOD sells the flatcars, leases those required to meet peacetime requirements, with a guarantee that the remaining inventory would be on standby in the event of a national emergency. This alternative is being further explored with Greyhound Financial Corporation, the only company which responded, and will be addressed in Part II of the DFRIF study. [Ref. 35:pp. 10, 11]

G. TANK CARS

Tank cars must be provided by the shipper; consequently, DOD must have an inventory of these cars to receive economically advantageous railroad freight rates. [Ref. 35:p. 15]

DFRIF tank cars are used primarily by the Defense Fuel Supply Center (DFSC) (227 of the 283 20,000-gallon general purpose tank cars). DFSC-purchased fuel is transported from major suppliers to DOD-owned or -leased distribution centers. Without DFRIF tank cars, DFSC would have to use high cost modes of transportation. [Ref. 35:p. 15]

Initially, bulk liquids were transported in 10,000-gallon DOD tank cars. In 1976, 162 20,000-gallon cars were procured and in 1978/79, 119 20,000-gallon special purpose cars were converted from acid to petroleum use. In 1986, two more were converted resulting in a current inventory of 28320,000-gallon cars. These actions were based on the following DOD considerations:

1. DOD will continue to experience requirements for tank cars in the future.
2. All existing 10,000-gallon tank cars reach their 40-year life and must be mandatorily retired from interchange service by FY 95.
3. Use of 20,000-gallon cars results in lower freight costs.
4. Procurement versus leasing of the 20,000-gallon cars is the most cost effective method of acquisition [Ref. 35:pp. 15, 16].

H. FINDINGS AND DISCUSSION

1. Finding 1

All 283 20,000-gallon general purpose tank cars currently owned by DOD are required to meet DOD's peacetime railcar requirements [Ref. 35:p. 16].

As stated above, DFSC utilizes 227 of the 284 20,000-gallon cars. The remaining 56 cars are allocated to the Department of the Air Force, Air Logistics Command, for transportation of special fuels from refineries. All of the DOD-owned tanks cars averaged 11.7 trips per car in 1986, well above the six trips per year for the industry standard. [Ref. 35:p. 16]

2. Finding 2

The railroads do not provide shippers with tank cars and will not do so in the future [Ref. 35:p. 16].

As a matter of practice, the rail industry does not provide shippers with tank cars. "The federal courts have historically considered tank cars as not only a car but a package for the goods which must have special mechanical means of loading and unloading" [Ref. 35:p. 16] Consequently, the system consists of private ownership of tank cars. AAR representatives indicate this practice will remain as is. [Ref. 35:p. 16]

3. Finding 3

Industry is not interested in unconditionally purchasing DOD's 20,000-gallon tank cars and only minimally interested in purchasing them with a lease back provision. Industry is interested in leasing to DOD additional tank cars (20,000-gallon and/or greater capacity cars) to meet future requirements [Ref. 35:p. 16].

Industry is uninterested in procuring DOD's 20,000-gallon tank cars without a lease back provision. They have no use for the 20,000-gallon cars since the 23,500-gallon capacity car is today's preferred car. Plus, certain 20,000-gallon tank cars are over abundant in the marketplace. [Ref.35:pp. 16, 17]

4. Finding 4

Tank cars with capacities greater than 20,000-gallons have limited application in meeting DOD's tank car requirements [Ref. 35:p. 17].

Of 20 military installations receiving fuel shipments in tank cars, only nine indicated they could not receive shipments in excess of 23,000. But, these nine receive approximately 68% of the fuel being transported. [Ref. 35:p. 17]

5. Finding 5

Ownership of tank cars allows DOD to transport certain bulk fuel shipments at reduced costs and provides DOD with operational flexibility. Delivery of bulk fuel shipments in tank cars also helps sustain commercial rail lines and rail receiving capabilities at DOD installations [Ref. 35:p. 17].

From 1984 through 1986, DOD saved more than $1.5 million in transportation costs by using rail over motor. "Also, use of tank cars in peacetime helps sustain commercial rail lines and rail receiving capabilities at military

installations. This ensures the availability of rail as an alternate delivery mode in a contingency" [Ref. 35:p. 17] Additionally, the tank cars can be used temporarily when there is a shortage of storage tanks at installations. [Ref. 35:p. 17]

I. ALTERNATIVES

1. Status Quo

DOD would continue to own and control the 283 20,000-gallon tank cars. The current market value for the 283 tank cars is $3,156,000. FY 86 administrative costs for the 20,000-gallon general purpose tanks cars were approximately $82, 353 ($291 per car). [Ref. 35:p. 18]

Operational and economic benefits result with the status quo alternative and risks are minimal although there is an uncertain long-term demand for tank cars. Future shifts from rail to pipelines or other modes could reduce tank car demand. If this occurs, the tank cars could be used for intra-Army ammunition plants' or commercial use. [Ref. 35:p. 19]

2. Sell and Lease Back

Under this alternative, MTMC would contract with and sell the tank cars to a leasing company and then lease them back. MTMC would maintain operational and maintenance responsibilities and mileage revenues. [Ref. 3:p. 19]

This alternative received one proposal which would result in a compounded cost of capital to DOD of more than

$20 million. Consequently, the status quo is economically preferable. [Ref. 35:p. 19]

3. Scrap and Lease Similar Cars

This alternative would entail disposing of the 283 20,000-gallon tank cars. At the same time, DOD would lease 283 similar tanks cars, retaining operational and maintenance responsibilities and railroad mileage allowances. [Ref. 35:p. 20]

The lowest cost estimate was for an ultimate total cash outlay of $10 million. Again, it is economically advantageous to stay with the status quo. [Ref. 35:p. 20]

4. Sell Without a Lease Back Provision

With this alternative, DOD would sell the cars to commercial car leasing/car management companies, then lease other, possible more modern tank cars. The sale would not be contingent on a lease back provision, Companies were not interested in this alternative, thus it is considered infeasible. [Ref. 35:p. 20]

5. Sell and Lease Back Larger Capacity Cars

Larger capacity cars aren't compatible with most DOD fuel delivery requirements. One company was interested in procuring the tank cars, provided DOD leased larger capacity cars. No cost estimates were provided by the company, and cost data wasn't requested due to the limited applicability of the larger cars. However, significant interest was demonstrated with respect to DOD leasing larger capacity cars

should new requirements emerge. Since some installations can accommodate larger capacity cars, this option will be analyzed again in Part II of MTMC'S study. [Ref. 35:p. 21]

J. APPLICATION OF CIVIL RESERVE AIR FLEET (CRAF) CONCEPT TO DOD'S RAIL REQUIREMENTS.

As previously mentioned, the CRAF program provides an expedient method to augment DOD-owned aircraft in the event of a national emergency. The same approach is viable for the DFRIF with some differences. Inactive railcars could be maintained by the railroads and prepositioned near installations with early deployment requirements. Research is currently being conducted to document the availability of commercial heavy-lift railcars. [Ref. 35:p. 13]

Additionally, rail asset enhancement by means of defense feature installation (strengthen floors and chain tie-downs) could increase DOD's readiness posture. [Ref. 35:p. 13] Trailer Train Corporation owns most of the general purpose flatcars employed commercially and militarily. However, these flatcars barely meet DOD heavy lift requirements. Trailer Train cars will be tested to determine their lift capacities, what enhancements are required, and the resulting costs. [Ref. 35:p. 14]

As previously stated, the rail industry is employing containerization and the use of specialized railcars. General purpose flatcars aren't in demand, and "incorporating defense features on double stack cars, articulated five

platform cars, plastic pellet covered hoppers, and tank cars is impractical." [Ref. 35:p. 14]

> Due to the length of time required to obtain and place rail assets where needed, use of existing CRAF procedures to identify and obtain specific cars to meet early deploying requirements in a contingency would prove ineffective. However, using the CRAF concept could allow DOD to direct commercial railcars to specific loading locations to meet follow-on requirements. This concept is being further evaluated to assess its practicality. [Ref. 35:p. 14]

K. DFRIF STUDY CONCLUSIONS/RECOMMENDATIONS

1. DOD should not sell or scrap its rail assets. Instead, DOD should continue to own and operate existing DFRIF equipment to meet its peacetime and contingency railcar needs.

2. DOD should pursue the possibility of establishing a CRAF-type program for rail as a means to augment the DFRIF in a contingency.

3. If the requirements determined in Part II of MTMC's study so warrant, DOD should also pursue the enhancement of existing, commercially-owned rail assets, as a means of improving DOD's contingency readiness [Ref. 35:p. 23].

V. SUMMARY AND CONCLUSIONS

A. SUMMARY

An effort has been made in this thesis to address defense transportation issues within each TOA which could impact upon DOD's ability to deploy and sustain military forces worldwide. A brief summary of each major chapter follows:

1. Chapter II, Military Sealift Command. In this chapter, the demise of breakbulk shipping and its effect on DOD sealift capability was analyzed. The results indicate that breakbulk shipping is not a critical factor in overall strategic mobility. The vessels most suitable for the majority of logistical support scenarios are the RO/RO, barge-carrying vessels, containerships, and breakbulk, in generally that order.

2. Chapter III, Military Airlift Command. The civilian airline industry's ability to augment organic airlift resources in the event of a national emergency was the focus of this chapter. Current projections are that the CRAF will increase strategic capability by 50%. However, several problems exist which reduce this projection significantly. These problems are (1) a shrinking air cargo industry, (2) a lack of compensation to offset specific risks outlined by the airline industry, (3) MAC's inability to project long-range cargo requirements, (4) stringent CRAF entrance requirements, and (5) an ASIF funding shortfall. Options available to MAC include acquiring and storing freighters for future activation, requiring the installation of defense features in civil aircraft, and providing additional incentives to the airline industry. These options may resolve some of the issues; however, the primary problem appears to exist within the MAC's management of the system (see (3), 4), and (5) above).

3. Chapter IV, Military Traffic Management Command. This chapter questioned the rationale behind DOD-owned rail assets, whether or not industry could meet DOD peacetime and mobilization

requirements, and the feasibility of instituting a CRAF-type program for rail. Subsequent conclusions were that industry could not meet DOD requirements, thereby supporting the need for DOD-owned rail. Additionally, the establishment of a CRAF-type program is feasible, to include a defense feature enhancement program.

A final question remains. Will the newly developed USTRANSCOM help or hinder the strategic capability of the TOAs? This question will be addressed in the remainder of the chapter.

B. UNITED STATES TRANSPORTATION COMMAND (USTRANSCOM)

The primary purpose for developing a USTRANSCOM was to "establish a single unified command to integrate global air, land, and sea transport." [Ref. 36:p. 39] Also referred to as the Unified Transportation Command (TransCom), the organization not only monitors peacetime transportation assets but also orchestrates the deployment of personnel and materiel worldwide prior to and subsequent to a war. [Ref.36: p. 39]

The MAC Commander is responsible for TransCom, which will be co-located with MAC at Scott Air Force Base, Illinois. The command will consist of approximately 500 personnel, and the MAC Commander will be responsible for all ships, aircraft, rail cars, and port management facilities required for a joint deployment. These assets are controlled by the three TOAs and will be allocated in the following manner during a joint deployment effort:

1. MSC will provide 51 of its 150 ships for a joint deployment. In the event of a war, 116 ships from the RRF will be utilized. [Ref. 36:p. 40]

2. MAC will provide 234 C-141 "Starlifters," 77 C-5 aircraft, and 500 C-130 "Hercules" transports [Ref. 36:p. 40]. Also, the CRAF will be activated should a war occur.

3. MTMC will be responsible for delivering requisite supplies to the MSC ships, as well as embarkation and debarkation requirements. [Ref. 36:p. 40]

The TOA commanders will continue to manage their organizations through their respective service secretaries during peacetime operations; however, during a joint deployment, they will report to the TransCom commander. TransCom will advise the TOAs of available transportation assets and what supplies are available once they are engaged in battle. Additionally, the resupply of land, sea, and air contingencies will be controlled by TransCom. [Ref. 36:p. 40]

The installation of TransCom is designed to eradicate previous problems experienced with the much criticized Joint Deployment Agency (JDA). The JDA did not have the authority to order required information from the TOA commanders (who were reluctant to share the information) whereas the TransCom commander, as a Commander-in-Chief (CINC), will. [Ref. 36:p. 43]

Support for the TransCom is divided. Former Navy Secretary Lehman, responsible for the veto of the previous attempt to merge MTMC and MSC, sees no use for the TransCom.

"To take the Military Sealift Command and put it out in Illinois under an Air Force commander has to be taking the process of reorganization for its own sake to an absurd extreme," said Secretary Lehman [Ref. 36:p. 44]. Marine Commandant Gen. Kelley proposes further research into the matter by a civilian think tank. His concern is that dedicated Marine resources could be utilized for joint deployments versus solely Marine Corps operations. [Ref. 36:p. 44]

Additional concerns were voiced by the Navy, Marine Corps, and Army: What does the MAC commander know about sealift? Will he be objective when it comes to allocating scarce resources between the TOAs? Says Air Force Col. F. Selzer, head of the strategic mobility division in the Joint Chiefs of Staff Logistics Directorate, the Navy will have an opportunity to address any problems with the defense secretary and Congress in the event of any conflict. [Ref. 36:pp. 44, 45]

On the positive side of the debate, MSC's deputy director of plans states that TransCom will ensure that the TOAs allocate monies for the automated data processing (ADP) master plan which will consolidate the logistical data bases of the TOAs. Should there be any reluctance on the part of the TOAs to participate, the TransCom commander can confer with the Joint Chiefs of Staff chairman and the SECDEF for additional support. Additionally, the TransCom commander

will be a member of the Defense Resources Board, a vehicle which to sell his programs. Finally, the TransCom commander not only develops deployment plans, but he has execution authority. [Ref. 36:p. 44]

Although there is considerable debate over the establishment of the TransCom, the TOAs and other interested parties are going to have to accept it. "The objections of all the devil's advocates were heard at the highest levels. TransCom is here to stay," says MSC's deputy director of plans [Ref. 36:p. 45].

C. CONCLUSIONS

The MSC has overcome the breakbulk shipping issue through a combination of acquisitions, conversions, and new ships. The MTMC has defined, justified, and acquired rail assets to support its mobility requirements. The MAC, however, appears to have the most difficult problems to resolve. Not only does MAC have the enormous task of resolving the internal and external problems related to the CRAF and insufficient lift capacity, but its commander now has the responsibility of TransCom. This thesis addressed one issue per TOA, and it is recognized that there may be other aspects of each TOA that pose major internal and external problems affecting strategic mobility. However, based upon the research completed, the MAC's ability to effectively assume additional transportation responsibilities seems questionable.

With respect to the management of overall DOD transportation resources, the TOA most capable of currently meeting its mobilization requirements would be the optimal choice for TransCom commander. This would lend credibility to the TransCom and facilitate "big picture" planning on the part of the TransCom commander as opposed to focusing on major in-house problems.

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